NO-RETURN LOOP FUEL SYSTEM

Abstract of the Disclosure

A no-return loop fuel injection system supplies fuel from a turbine-type fuel pump to an injector fuel rail, through a fuel pressure valve assembly capable of flowing supply fuel to the injector rail, and reverse flowing fuel from the rail and back through the pump to relieve rail fuel pressure. Preferably, the pressure valve assembly has a pressure control valve of a diaphragm type which is biased closed via a spring disposed within a reference chamber defined between a housing and a side of the diaphragm and vented to atmosphere. A fuel chamber defined between an opposite side of the diaphragm and a valve body communicates between a pump-side port and a rail-side port. With the valve in a closed position, the fuel chamber is divided into a rail sub-chamber and a pump sub-chamber via the sealing relationship between a valve seat and the diaphragm, held closed by a closure biasing force of the spring. The pressure control valve moves to an open position when the hydraulic force produced by the fuel pressure acting on the fuel chamber side exceeds the closure biasing force of the valve. The fuel hydraulic force is generally calculated as the product of the fuel pressure within the pump-side port times the area of an outer portion of the diaphragm which defines in part the pump sub-chamber, plus the product of the residual fuel pressure within the rail-side port times the area of an inner portion of the diaphragm which defines in part the rail sub-chamber of the fuel chamber. Preferably, the pressure valve assembly also includes a flow check valve orientated in a parallel flow configuration to the pressure control valve to promote starting of the engine during reduced fuel pump output and to eliminate fuel vapor lock within the fuel rail.